

THE MARKET PERFORMANCE AND DETERMINANTS OF NET RETURNS TO ARTISANAL FISH IN NDIBE BEACH, AFIKPO NORTH LGA, EBONYI STATE, NIGERIA

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ABSTRACT

The study was conducted in Ndibe Beach, Afikpo North LGA Ebonyi State of Nigeria. The specific objectives were to; describe the socio-economic characteristics of artisanal fishermen, fish wholesalers and retailers in the study area; determine structure, conduct and performance of artisanal fish marketing in the area; determine market share, margin and efficiency of artisanal fish marketing in the study area; determine the costs and returns of artisanal fishing in the study area; determine factors influencing the amount of income generated from artisanal fishing and marketing by the fishermen, wholesalers and retailers in the study area; identify problems encountered by the fishermen and marketers in the study area. Both purposive and simple random sampling techniques were used in selecting samples. A grand sample size of 120 (fishermen= 40, wholesalers = 40, retailers = 40) was used for the study. Descriptive and inferential statistics such as frequency distribution tables, means and percentages, marketing margin analysis, net return analysis and OLS multiple regression model were used to analyze collected data and draw inference. The cost and return analysis showed that artisanal fishing was a profitable business venture. The marketing price of the fishermen, wholesalers and retailers per 1kg of fish sold in a bowl in the study area were N280.50, N690.2 and N940.0 respectively, while their marketing margins were N280.50, N 409.7 and N319.8 respectively. The wholesalers marketing margin and share of the market were considered to be the highest when compared to those of the fishermen (producers) and retailers. The result of the multiple regression analysis showed that age, household size, farming experience and access to credit were significant determinants of fishermen net returns while age, educational level, price of the product (fish) and transport cost were significant determinants of the marketers'(wholesalers and retailers) income. Major problems encountered by the fishermen were inadequate storage facilities (80.0%) and unpredictable weather (70.0%) while problems encountered by the artisanal fish marketers in the study area include inadequate storage facilities (76.67%) and transportation difficulties (60.0%). The State government should provide incentives that will motivate unemployed able bodied youths to embrace the business instead of staying idle.

Key words: Artisanal fishing, Market performance, Ndibe beach, fishermen

INTRODUCTION

Artisanal fishing comprises 90% of all fishing jobs worldwide, approximately 45% of the world's fisheries, and nearly a quarter of the world catch. They provide critical income and edible protein to hundreds of millions across the globe. Artisanal or small scale fisheries are traditional fisheries involving fishing households (as opposed to commercial companies), using relatively small amount of capital and energy, relatively small fishing vessels (if any), making short fishing trips close to shore and fishes caught are mainly for local consumption. Artisanal fishing can be for subsistence or commercial purpose (UNEP/ETB, 2005).

Nigeria is blessed with abundant natural and human resources. Water bodies are among the important natural resources bequeathed to Nigeria by nature (Anyanwu *et al.*, 2009). The hunting, catching and marketing of edible fresh water and ocean fishes largely dominate fishing industry in Nigeria. Basically, Fish-supply in Nigeria is either from capture fisheries, fish-farming or importation (Adewumi, *et al.*, 2012; Anyanwu *et al.*, 2009). Captured fisheries involve the harvesting of naturally existing stocks of wild fish. This can be done either by small scale/artisanal fishers or by industrial/commercial trawlers. Artisanal fishing activities constitute the traditional occupation of communities possessing these water sources such as lakes, streams, oceans and rivers.

Statistics have shown that artisanal fish production has continued to be the major source of fish to Nigeria over the past two decades (FDF, 1995). Domestic fish production of about 500,000 metric tonnes is supplied by artisanal fisher-folk. Artisanal fishing accounted for more than 80.0% of total fish production in Nigeria (Adewumi, *et al.*, 2012); while aquaculture accounted for less than 8.0% of the production and industrial fishing fluctuates with a peak of 13.9% and minimum of 5.0% (Bada, 2005)

The artisanal fishermen in Nigeria, total about half a million and approximately 42 percent of these numbers are part-time fishermen who also engage in other economic activities such as farming and trading. The predominant craft used in artisanal fisheries in Nigeria are dugout and wooden canoes or a combination of both that are more often not motorized (Anene *et al.*, 2010; Mabwaonuku, 1998).

Fish protein is rich in amino acids and is therefore, described as first class or good quality protein (Adeniyiet *al.*, 2012). According to Adekoya and Miller (2004), fish is an important source of protein to the large teaming population in Nigeria and it represents about 55.0% of the protein

sources intake of Nigerians. Apart from utilization as food, fish are used in medicinal preparation (fish oils), in fashion industry, recreation (sport fishing) and other agricultural industries; fish meals, ornamental and decorations (Bolorunduro, 2004). This has informed part of the reasons for the acceptability of fish.

According to Akinleye and Rahji (2006) Nigerian agriculture is characterized by low farm incomes, low capacity to satisfy food needs of the country and traditional techniques of production. This assertion is reflected in the fish industry where large population of Nigerians are fish consumers with a demand estimated at more than 1.4 million tonnes annually out of which domestic production make up only 700,000 tonnes, which constitutes 50% of the total demand. This situation and neglect of aquaculture and inland fisheries development over the years have made Nigeria to become one of the largest fish importers (some 700,000 tonnes per year) in Africa, costing the country more than \$US 2 billion every five years as payment for imported fish (Jim and Tunde, 2004).

Fish marketing like the marketing of other agricultural products entails performance of various functions along the distribution chain of the commodity. These include physical functions (processing, assembling, packaging/grading, transportation, storage/preservation), exchange, facilitating and institutional functions. In performing these functions, the actors involved (fishermen, processors and traders) play specific important roles (Okpani, 2012). Reducing fish post-harvest loss requires improving its marketing system which in turn will improve supply from artisanal fish industry, thus saving the country's foreign exchange reserve. To improve the marketing system of artisanal fish, the organization and performance of the marketing system, the actors involved and their roles must be adequately investigated and understood.

Fish supply from the three sub-sectors; artisanal, aquaculture and industrial on the average had not met 30 per cent of the required fish demand in the last 20 years (Adewumi, *et al.*, 2012). In spite of the abundant water resources that the country has, the larger portion of the country's fish requirement is met from importation. In spite of the relevance of artisanal fishing to the economy, only few studies Inioni, and Oyaide (2007); Anyanwu, Mkpado, and Ohaka, (2009); Onemolease and Oriakhi, (2011); Adewumi, *et al.*, (2012) have been carried out to assess the profitability of the enterprise and constraints faced by the fishermen. However, all these studies used gross margin in their analysis and failed to compute the fixed cost component of artisanal

fishing. None of the studies disintegrated and determined relationship between demographic characteristics of artisanal fish fishermen/marketers and the economic returns of artisanal fishing/marketing.

In artisanal fisheries, even after the application of traditional curing practices, fish is still subject to many forms of loss and spoilage (Suleiman, 2007). According to Bolorunduro, (2004), reducing post-harvest fish losses will increase the availability of fish proteins, enhance the nutritional status of the people, reduce fish importation and save the country's foreign exchange earnings. The small scale nature of operation by fishermen, fish processors and marketers in the artisanal fisheries sub sectors compounds the constraints imposed upon them in their operating environment.

Therefore, this research specifically sought to: describe socio-economic characteristics of artisanal fishermen, wholesalers and retailers in the study area; identify market channels of artisanal fish marketing in the study area; estimate market share and margin of artisanal fish marketers in the study area; estimate the cost and returns of artisanal fishing in the study area; and determine factors influencing amount of income generated from artisanal fishing and marketing in the study area and identify problems encountered by the fishermen and marketers in the study area.

METHODOLOGY

Study Area

The study was conducted in Afikpo North Local Government Area (LGA) of Ebonyi State, Nigeria. The study area was purposively chosen because of the presence of a tributary of the Cross River in the area where artisanal fishing takes place on a large scale and a famous beach at the river shore called Ndibe beach where artisanal fish marketing also takes place. Ndibe beach is located in Ndibe, a fishing village situated in Nkpogoro ward. The main occupation of the people is fishery related. The men are predominantly artisanal fishermen while the women are fish marketers. The fishermen embrace farming as their secondary occupation especially during the dry season when fishing intensity is very low. Both the fishermen and fish marketers belong to their respective associations. A non-member of these associations is usually prevented from participating. Fishing activities are carried out along the Cross River and the fishermen sell their catches either processed

or fresh fish in Ndibe beach. The people of Ndibe village dredge the river at regular intervals and usually sell the dredged sand, thus deriving additional income. The area has enough land to support the production of Cassava, Yam, Maize, Rice, Okro, Cocoyam, Cucumber and Sweet potatoes, but these are grown on a small-scale. Animals reared include: Goats, Sheep, Cattle, Pigs and Poultry.

Afikpo North Local Government area is one of the thirteen (13) Local Government Areas in Ebonyi State. The LGA lies between Latitude $5^{\circ} 30^1$ and $5^{\circ} 40^1$ North of the equator and longitude $7^{\circ} 25^1$ and $7^{\circ} 32^1$ East of the Greenwich Meridian. It is bounded in the North by Ohaozara LGA of Ebonyi State and Onitsha Local Government Area of Anambra State, in the west by Afikpo South Local Government Area, in the East and West by Abi and Biase LGAs of Cross River State. The population of the Local Government Area was 126, 576 persons (NPC, 2006). It has a relatively high population density of 277.176 persons per square kilometer. Its mean annual temperature is 30°C ; while its annual rainfall lies between 1700mm – 2000mm.

Sampling Technique

The sample for the study comprises artisanal fishermen, artisanal fish wholesalers and retailers. This study adopted both purposive and simple random sampling techniques in selecting respondents. First, two communities Enohia-Nkalu and Nkpoghoru that make use of Ndibe beach for its fish marketing activities were purposively selected being the predominant fishing communities in the area.

A list containing the names of fishermen from these communities who sell their fishes at Ndibe beach was formulated with the help of native enumerators. One hundred and seven fishermen names were thus formulated (63 from Enohia-Nkalu; 44 from Nkpoghoru). Eighty fishermen were randomly selected from the list (40 from each of the communities). This gave a sample size of eighty (80) fishermen.

In order to select the artisanal fish wholesalers and retailers. Another list which contained names of the traders who patronized the fishermen was formulated. From this list, 40 fish wholesalers and 40 fish retailers were randomly selected according to the quantity of fish handled per week (traders who handled 10 or more baskets of fish = wholesalers, traders who handled less

than 10 baskets of fish = retailers). This gave a grand sample size of one hundred and sixty (fishermen= 80, fish wholesalers = 40, retailers = 40).

Method of Data Collection

The study employed primary data for its analysis. The Primary data which was collected monthly for a one year period were elicited by the use of pre-tested and structured questionnaires drawn from artisanal fishermen and marketers in Ndibe beach. The data of interest included personal and household characteristics; membership of marketing associations, fish output, prices and income. The average result of the computed data was used for analysis. However, other relevant information was collected from secondary sources such as texts, journals, learned publications, agricultural institutions and the internet.

Method of Data analysis

In order to realize the purpose of the study, a number of statistical tools were employed in analyzing data obtained for the study. Descriptive statistics such as frequencies' tables, means and percentages were used to analyze the socio-economic profile of artisanal fishermen, wholesalers and retailers. Flow chart was used to describe the market channel of artisanal fish in the area. Marketing margin analysis was used to obtain estimates of market share and margin of artisanal fish marketers. The net return analysis and capital position tools were used to draw conclusion on the profitability and financial strength of artisanal fishing (net return was used instead of gross margin in order to account for actual profit by taking cognizance of fixed cost). Factors influencing amount of income generated from artisanal fishing and marketing was determined with the use of OLS multiple regression model.

Model Specification

The net return model is specified below,

$$NR = \sum P_i Q_i - (TVC + TFC) \quad (i)$$

Where

NR = Net return;

Σ = Summation sign;

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P_i = unit price of output (fish);

Q_i = Quantity of each output;

TVC = Total variable cost;

TFC = Total fixed cost derived by depreciating fixed assets.

The capital position tools were employed in this research work to determine the financial strength and weakness of artisanal fishing and marketing (Olukosi and Erhabor, 2005, Anyiro *et al* 2012). It is therefore necessary to examine other measures of financial success such as:

$$\text{Return per capital invested} = \frac{\text{Net farm income (NFI)}}{\text{Total cost of production (TCP)}} \quad (\text{ii})$$

$$\text{Rate of return on equity RRE} = \frac{\text{Net income}}{\text{Capital invested}} \times \frac{100}{1} \quad (\text{iii})$$

Marketing margin was computed as the difference between the payment received by the seller and the prices paid by the buyers for a finished product and for equivalent quantities of product. Marketing margin = payment received by seller – price paid by the buyers. Total marketing margin for artisanal fishing and marketing equals the sum of retail and wholesale marketing margin.

Given as:

$$MT = Mw + Mr$$

Where

Mw = wholesale marketing margin

Mr = retail marketing margin

MT = total marketing margin

The multiple regression model is implicitly stated as follows:

$$Y = F(x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, U) \quad (\text{vi})$$

For Fishermen:

Y = net returns of artisanal fishermen (Naira)

X_1 = Age (Years)

X_2 = Marital status (Married = 1, otherwise = 0)

X_3 = Household size (Number)

X_4 = Artisanal fishing experience (years)

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X_5 = Educational level (years)

X_6 = access to credit (yes = 1, No = 0)

X_7 = Labour cost (Naira)

U = Stochastic error term.

For Fish wholesalers:

Y = profit realized from artisanal fish marketing (Naira)

X_1 = Gender (male = 1, female = 0)

X_2 = Age (Years)

X_3 = Marital status (Married = 1, otherwise = 0)

X_4 = Artisanal fish marketing experience (years)

X_5 = Educational level (years)

X_6 = Price of product (Naira)

X_7 = access to credit (yes = 1, No = 0)

X_8 = Household size (Number)

X_9 = Transport cost (Naira)

X_{10} = Labour cost (Naira)

e_i = Stochastic error term.

For Fish retailers:

Y = profit realized from artisanal fish marketing (Naira)

X_1 = Gender (male = 1, female = 0)

X_2 = Age (Years)

X_3 = Marital status (Married = 1, otherwise = 0)

X_4 = Artisanal fish marketing experience (years)

X_5 = Educational level (years)

X_6 = Price of product (Naira)

X_7 = access to credit (yes = 1, No = 0)

X_8 = Household size (Number)

X_9 = Transport cost (Naira)

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X_{10} = Labour cost (Naira)

e_i = Stochastic error term.

Four functional forms (Linear, Exponential, Semi-log and Double-log function) of the specified model will be tried and the best fitted line will be chosen as the lead equation. The choice of the best functional form was based on the values of R^2 coefficient, the magnitude of the F-ratio as well as the conformity to *a priori* expectations of signs of coefficient and the number of significant parameter.

The four functional forms used are specified following Osondu and Ijioma (2014) as follows;

Linear Form:

$$Y = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + b_9x_9 + b_{10}x_{10} + e_i$$

Semi – log form:

$$Y = b_0 + b_1\log x_1 + b_2\log x_2 + b_3\log x_3 + b_4\log x_4 + b_5\log x_5 + b_6\log x_6 + b_7\log x_7 + b_8\log x_8 + b_9\log x_9 + b_{10}\log x_{10} + e_i$$

Double log form:

$$\log Y = b_0 + b_1\log x_1 + b_2\log x_2 + b_3\log x_3 + b_4\log x_4 + b_5\log x_5 + b_6\log x_6 + b_7\log x_7 + b_8\log x_8 + b_9\log x_9 + b_{10}\log x_{10} + e_i$$

Exponential form:

$$\log Y = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + b_9x_9 + b_{10}x_{10} + e_i$$

RESULTS AND DISCUSSION

Table 1 showed the general characteristics of artisanal fishermen, wholesalers and retailers involved in this study. The mean age of artisanal fishermen, wholesalers and retailers were 47 years, 44 years and 38 years respectively. The distribution showed that a fair and moderate proportion (40.00% and 20.0%) of the artisanal fishermen and marketers in the study area were within the ages of 31 and 40 years respectively, while, 42.50% of the retailers were aged between 31 and 40 years. This is an indication that the artisanal fishermen and marketers in the study area were still energetic and not within the national retirement age bracket (60 – 70 years).

The risk bearing and innovativeness of a farmer, his mental capacity to cope with the daily challenges and demands of fishery enterprise decreased with advancing age (Dama, 2001). Meanwhile this result supports the findings of Ajala *et al.*, (2006) that fish farming is an adult business.

The Table showed that 100.0%, 30.0% and 42.50% of the artisanal fishermen, wholesalers and retailers in the study area were males respectively while 0.00%, 70.0% and 57.50% of them were females respectively. The result suggests that artisanal fishing is mainly carried out by males. However, females also play vital roles as helpers or suppliers of labour in light fishing operations, such as bailing water and processing caught fish.

In terms of marital status, majority (70.00%) and fairly good percentage (57.50%) of the artisanal fishermen and marketers (wholesalers and retailers) respectively were married. This implies that the married fishermen and fish marketers were more involved in fish farming and marketing business. The need to supplement the family's means of livelihood might have motivated participants to utilize available water bodies as means of livelihood (Adegboye *et al.*, 2008).

Literacy level was fair. The table revealed that a good proportion (52.50%) of the fishermen had primary school education while 47.50% and 55.0% of the wholesalers and retailers had secondary school education respectively. It is evident from the table that none of the fishermen and artisanal fish retailers had tertiary education while only 7.50% of the wholesalers had tertiary education. This indicates that the artisanal fishermen and marketers in the study area were fairly literate. This could have implications on the management and sustainability of the artisanal fishing and marketing enterprise.

Table 1 further showed that a fair proportion (37.50%, 42.50% and 47.5-%) of the artisanal fishermen, wholesalers and retailers marketers had between 6 and 10 years of fish farming and marketing experience respectively, while 47.50%, 40.0% and 22.50% of the three groups of respondents had between 11 and 15 years of fishing farming and marketing experience. Meanwhile, 10.0%, 7.50% and 22.50% of the three groups had between 1 and 5 years while 5.00%, 10.00% and 7.50% of the fishermen wholesalers and retailers respectively had above 15 years of experience in artisanal fishing and marketing. This implies that the respondents were well established and knowledgeable in fish farming and its marketing activities. The number of years a farmer has spent in farming may give an indication of the practical knowledge he had acquired on

how to overcome certain inherent problems in such farm enterprise (Okolo, 2007).

Table 1 distribution also revealed that 50.0%, 42.50% and 55.00% of the artisanal fishermen, wholesalers and retailers in the study area had household sizes of between 5 and 9 persons. The mean household size of the artisanal fishermen were 6 persons while mean household size of the wholesalers and retailers were both 5 persons. This showed that the sampled farmers could utilize their household members as sources of labour (Nosiru *et al.*, 2014) for fishing and processing. In the absence of well-functioning labor markets, larger households face little labor bottlenecks at critical points in the farming cycle (Ezeh *et al.*, 2012).

In terms of access to credit, majority (70.00%, 86.67% and 70.00%) of the artisanal fishermen, wholesalers and retailers respectively had no access to credit. *Inadequate capital is a major problem confronting small-scale enterprises including farmers in Nigeria.* Lack of access to credit facilities constitutes a constraint in purchasing raw materials and other enterprise inputs. According to past studies DBSA (2005); Anyiro and Oriaku (2011) access to credit is one of the important key elements in raising agricultural productivity.

Table 1: The socio-economic profile of artisanal fishermen and marketers in Ndibe Beach, Afikpo North LGA of Ebonyi State, Nigeria

Variables	Fishermen F: (n=80)		Fish wholesalers FW: (n=40)		Fish retailers FR: (n=40)	
	Number	Percentages	Number	Percent	Number	Percent
Age (years)						
0-30	0	0	0	0	4	10.00
31-40	32	40.00	8	20.00	17	42.50
41-50	22	27.50	15	37.50	8	20.00
51-60	16	20.00	5	12.50	7	17.50
Above 60	10	12.50	4	10.00	4	10.00
Mean: F =47; FM = 44; Fr = 38						
Gender						
Male	80	100.00	12	30.00	17	42.50
Female	0	0.00	28	70.00	23	57.50
Marital status						
Single	8	10.00	8	20.00	11	27.50
Married	56	70.00	23	57.50	23	57.50
Widow (er)	10	12.50	7	17.50	6	15.00
Divorced	6	7.50	2	5.00	0	0
Educational status						
No formal Education	12	15.00	9	22.50	8	20.00
Primary education	42	52.50	12	30.00	10	25.00
Secondary education	26	32.50	19	47.50	22	55.00
Tertiary education	0	0.00	3	7.50	0	0
Fishing/Marketing experience						
1-5	4	10.00	3	7.50	9	22.50
6-10	15	37.50	17	42.50	19	47.50
11-15	19	47.50	16	40.00	9	22.50
Above 15	2	5.00	4	10.00	3	7.50
Mean: F = 11, Fw= 10, Fr= 8						
Household size						
1-4	12	30.00	13	32.50	16	40.00
5-9	20	50.00	17	42.50	22	55.00
Above 9	8	20.00	10	25.00	2	5.00
Mean: F=6; Fm=5, Fr = 5						
Access to credit						
Yes	12	30.00	3	7.50	12	30.00
No	28	70.00	37	92.50	28	70.00
Total	40	100.00	40	100.00	40	100.00

Source: Field survey, 2014A diagrammatic representation of fish marketing channels in Ndibe Beach, Afikpo North LGA Ebonyi State of Nigeria is contained in Figure 1. The figure showed the different channels of fish marketing in the study area. It is seen that the fishermen sell their harvested fish to

the wholesalers who resell these products to retailers and the retailers sell to consumers. However, on the other hand, the fishermen also sell their products to the wholesalers, retailers and end users. The marketing channels have no specific direction as it follows different routes due to changes in the market condition.

The broken arrows represent alternative route of the product channels. This entails a skip of the normal route where a retailer bypasses the wholesalers and buys directly from the producer, and also consumers buy directly from the wholesalers skipping the retailers. The essence of this skipping is to purchase the goods in fresh conditions and at a reduced price. Hence, the marketing channel of fish in the study area could be termed a zero – level or a one – level marketing channel. To sell directly to the consumers, some fishermen acquired some retail outlets in some local markets outside their fishing domain, selling directly to consumers, helped them to earn a relatively higher income.

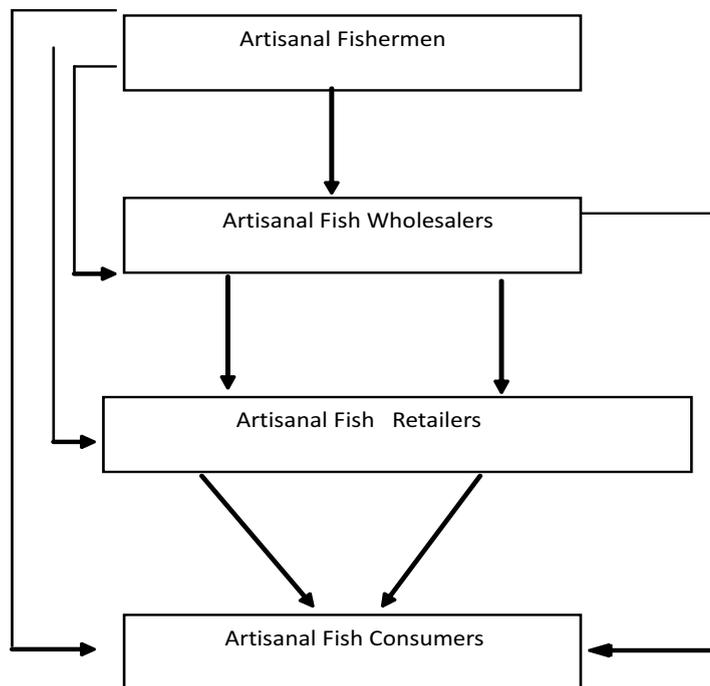


Figure 1: The Distribution Channels of artisanal fish marketing in Ndibe Beach, Afikpo North LGA of Ebonyi State, Nigeria

The computed cost and return analysis giving details of the annual elemental costs and returns involved in artisanal fishing in Ndibe Beach, Afikpo North LGA Ebonyi State of Nigeria is presented in Table 2. The results as shown in the table indicated that the total variable cost incurred in artisanal fishing was ₦32,580.00 while the total fixed cost was ₦20,4371.17 indicating a total cost of ₦236,951.17. Labour cost accounted for the highest percentage (55.56%) of total variable cost, followed by the cost of fuel and oil (27.32%). Also, interest on loan accounted for the highest percentage (64.43%) in the total fixed cost incurred in artisanal fishing in the study area.

The results further showed that artisanal fishing was a profitable business venture. This was evidenced by the gross margin and net profit of ₦653,803.0 and ₦449,431.83 respectively. The annual gross margin of ₦653,803 breaks down to an average gross margin of ₦54,483.58 per month, and compares favourably with the gross margin of ₦52,883.99 obtained by Adewumi et al., (2012) study on the profitability analysis of artisanal fishing in Asa River of Kwara state, Nigeria. The Return on investment was 2.20 indicating that everyone naira invested in the business yielded a net return of ₦2.20. The figures posted indicated that artisanal fishing is a safe and profitable venture because of the high return on the investment. This finding is in agreement with Ezech *et al.*, (2007).

Table 2: The Cost and returns of artisanal fishing in Ndibe Beach, Afikpo North LGA of Ebonyi State, Nigeria

Items	Unit	Unit cost	Quantity	Value (₦)	Percentage contribution to total cost
A. Revenue					
Quantity of fish consumed at home	Kg	280.5	320	61,710	
- Quantity of fish offered as gift	Kg	280.5	177	49,648.5	
- Quantity of fish sold	Kg	280.5	2050	575,025.00	
Total Revenue				686,383.0	
B. Variable cost					
- Cost of cast net				570.00	1.75
- Cost of hook				350.00	1.07
- Cost of spare parts				1,700	5.23
- Cost of rope				380.0	2.89
- Cost of fuel and oil				8,900	27.32
- Cost of bait				320	0.98
- Hiring of gear				260	0.79
- Labour cost				18,100	55.56
- Other input and other miscellaneous such as preservation cost				2000	6.14
Total variable cost				32,580.00	
D. Gross margin (A-B)				653,803	
E. Fixed cost					
- payment on land				59,200.57	28.97
- Interest on loan				131,670.60	64.43
- Depreciation cost on tools (machetes, canoes)				13,500	6.605
Total fixed cost				204,371.17	
Total cost				236,951.17	
Net return (D-E)				449,431.83	
Return per naira invested				2.20	

Source: Field survey, 2014

Table 3 Showed the Marketing margins, marketing efficiency and market share of the producers (fishermen), wholesalers and retailers of fish in Ndibe Beach, Afikpo North LGA Ebonyi State of Nigeria. The table revealed that the marketing price of the fishermen, wholesalers and

retailers per 1kg of fish sold in a bowl in the study area were ₦280.50, ₦690.20 and ₦940.00 respectively, while their marketing margins were ₦280.50, ₦409.70 and ₦319.80 respectively. The table further showed that the percentage market share of the fishermen, wholesalers and retailers were 29.84%, 43.59% and 34.02% respectively.

The wholesalers marketing margin and share of the market were considered to be the highest when compared to those of the fishermen (producers) and retailers. The reason could be attributed to the wholesalers' access to market information and improved transportation. The implication is that the wholesalers' tendency of exercising high economic power on price and thus, earning a higher profit at the expense of producers (fishermen) appeared to have not been checked.

Table 3: Marketing margins, marketing efficiency and market share of the fishermen, wholesalers and retailers of fish in Ndibe Beach, Afikpo North LGA of Ebonyi State, Nigeria

	Fishermen	Wholesalers	Retailers
Measurement	(1kg)	(1Kg)	(1kg)
Marketing Price	280.50	690.20	940.0
Marketing Margin	280.50	409.7	319.8
% Market Share	29.84	43.59	34.02

Source: Field survey, 2014 The multiple regression analysis result of the socio-economic factors influencing the net return of artisanal fishermen in Ndibe Beach, Afikpo North LGA of Ebonyi State, Nigeria, is shown in Table 4. All the four functional forms (Linear, Exponential, Semi logarithmic and Double logarithmic) were significant at given levels. This indicates that any of the four could be used for predictive purposes. But the Linear functional form was chosen as the lead equation based on statistical and econometric reasons such as the number of coefficients that are significant and in accordance with a priori expectation, the value of R^2 and the F-ratio. The R^2 value (0.8805) of the lead equation indicates that, about 88.05 percent of variability of banana and plantain output is attributed to the specified explanatory variables in the model. The F-statistic value of 11.51 is statistically significant at 1.0% probability level, suggesting that the results provided a reasonably good estimate of the underlying socio-economic characteristics that affect the total output of plantain and banana production in Umuahia Agricultural Zone of Abia State.

Specifically, the coefficient of age of the fishermen (-0.7356) was negative and statistically

significant at 95.0% confidence level. The sign of the variable is in agreement to a *priori* expectation. This implies that as the age of the fishermen increases, their net returns from artisanal fishing decrease. The younger fishermen in the study area were more productive than the older fishermen. This might be plausible because the younger fishermen were expected to have more vigour for farm activities than the older ones *ceteris paribus*. Meanwhile, experience gained as a result of old age and also while operating the fishing business could make significant impact on the output. This is an index of entrepreneurial success (Ezeh *et al.*, 2012). The result compares favourably with Nosiru *et al.*, (2014) study which revealed that age had a negative significant effect on productivity of NERICA rice farmers.

The coefficient of household size (2.931702) was positive and significant at 1.0% risk level showing direct relationship with net return. The positive coefficient implies that a unit increase in the household size will raise the profit level from fish capture. This indicates that the household members were not economic dependents and sometimes joined in fishing expeditions. The result is in conformity with a *priori* expectation and in agreement with Osondu, *et al.*, (2014) study that found household size to be positively related to farm output (net return). According to Zekeri and Tijani (2013) family labour contributes positively to increase in output of farm produce.

The relationship between farming experience and the net return of fishermen in the area was strong and positive. The coefficient (118.9271) is statistically significant at 1.0% risk level and implies that as the years of experience in artisanal fishing increase, the net return also increases. The sign of the variable is in consonance with a *priori* expectation. Experience gained while operating the fishery business would thus make significant impact in the managerial ability of the enterprise, hence increased profit. This result corroborates the findings of Ezeh *et al.*, (2008) that more years of farming experience would make farmers better positioned to make rational choice and decision among alternative farm inputs.

The coefficient of access to credit (1.2705) was positive and statistically significant at 1.0% probability level. The sign of the coefficient is in conformity with a *priori* expectation and agrees with Ezeh *et al.*, (2012), that quantity of farm inputs used in the farm would increase as the resource holding capacity of the farmers' increases, hence increase in net return. Fishermen would be more disposed to purchase and use more fishing inputs when the investment funds increase as a result of access to credit which in turn would result in an increase in the profit level. Hence, the fishermen in

the study area are indeed displaying rational economic behaviour.

Table 4: The Estimate of factors that affect the income of artisanal fishermen in Ndibe Beach, Afikpo North LGA Ebonyi State of Nigeria.

Variable	Linear+	Functional	Forms	Double-log
		Exponential	Semi-Log	
Constant	39016.79*** (3.89)	9.734553*** (16.13)	-99202.15 (-1.03)	7.251484** (2.34)
Age	-0.7356*** (3.32)	-0.01227 (-0.38)	709.6209* (1.55)	-0.144885** (2.15)
Marital status	2.9317 (1.32)	0.61333 (1.00)	26425.26 (1.70)	0.610425 (0.94)
Household size	0.08873*** (3.02)	0.000015*** (5.05)	817.6402 (0.05)	-0.127593* (1.95)
Farming Experience	118.927*** (3.61)	0.01178 (0.46)	2549.344*** (2.68)	0.284256* (1.81)
Education level	-1538.353 (-1.20)	-0.00806 (-0.22)	0.265 (0.68)	-0.102051 (-0.48)
Access to credit	1.2705*** (2.91)	0.0068292** (2.12)	0.2374149 (0.69)	0.28953*** (2.59)
Causal labour cost	2.16e-06 (1.42)	0.000068 (0.40)	0.0356818 (1.36)	0.07033 (1.40)
R ²	0.8805	0.6504	0.7575	0.6352
Adjusted R ²	0.8547	0.6015	0.7199	0.5536
F-value	11.51***	6.25***	9.03***	6.13***

Source: Field survey, 2014.

+ Lead Equation; ***, **, * indicates that variables are significant at 1.0%, 5.0% and 10.0% risk levels, respectively ; Figures in parentheses are t-ratio.

The result of the multiple regression estimates of the factors that influenced net income of artisanal fish wholesalers in Ndibe Beach, Afikpo North LGA of Ebonyi State, Nigeria, is shown in Table 5. The table result showed that all the functional forms (linear, exponential, semi-log and double log) of the regression were statistically significant at 1.0% probability level implying that any of the functional forms is adequate in estimating and explaining the variations in the profitability of artisanal fish wholesalers in the study area. However, the profit equation was best estimated and

explained using the exponential functional form which explained 96.59% of the total variation at 1.0% risk level. Furthermore, other statistical and econometric considerations such as the number of significant coefficients and their conformity to *a priori* expectations were in favour of the exponential functional form. The F-statistic value of 37.78 is statistically significant at 1.0 alpha level, suggesting that the R^2 is significant and the estimated linear regression equation has goodness of fit.

Specifically the coefficient of age of the wholesalers (0.222483) was positive and statistically significant at 99.0% confidence level. The sign of the variable is in consonance with *a priori* expectation. This implies that the older the wholesalers, the more experience gained in marketing, hence, increased in net return. The experience gained as a result of old age and also while operating in the business would thus make significant impact. This is an index of entrepreneurial success (Ezeh *et al.*, 2012).

The table further showed that the coefficient of educational level (1.053168) was positive and statistically significant at 1.0% risk level. This implies that the profit realized from the business increases as the literacy level of the wholesalers increases. This is in consonance with *a priori* expectation. The result agrees succinctly with (Onyebinama, 2004), who stated that the level of educational attainment is likely to affect the degree of one's business alertness and ability to seize business initiatives and advantages, hence increased profit.

The coefficient (0.6335164) of the price of the product (fish) was positive and statistically significant at 5.0% alpha level. This suggests that the profit arising from the sale of fish would increase as the price of the product increases. This result is in consonance with Osondu *et al.*, (2014) who obtained similar result in their study of economic analysis of pig production in Abia state, Nigeria.

Furthermore, the coefficient of transportation cost (-1.801492) was negative and statistically significant at 10.0% alpha level. The sign is in accordance with *a priori* expectation. This implies that the higher the transportation cost (variable cost) incurred in artisanal fish marketing, the lower the profit realized by wholesalers. All things being equal as variable cost increases the profit margin will decrease. This result is in line with economic theory.

Table 5: The Estimate of factors that affect the net income of artisanal fish wholesalers in Ndibe Beach, Afikpo North LGA Ebonyi State of Nigeria.

Independent variable	Functional forms			
	Linear	Exponential ⁺	Double log	Semi log
Constant	305583.4 (0.51)	-1.67e+07 (-0.75)	14.9094 (0.76)	-287983.2 (-0.95)
Gender	-185657.3 (-1.08)	.2606564 (1.05)	-0.4081065 (1.09)	-481216.2 (1.14)
Age	14474.19 (0.09)	.222483*** (2.90)	1.928989* (1.93)	1044816 (0.93)
Marital status	-273027 (-1.02)	0.3201883 (0.51)	-0.7486112 (-0.80)	-85056.08 (-0.08)
Marketing experience	-19062.69 (-0.32)	1.58e-06 (1.34)	-0.4247507 (-1.12)	-307382.3 (-0.72)
Educational level	21796.9 (0.31)	1.053168* (1.82)	0.4634029 (1.36)	1071359*** (2.79)
Price of fish	1.077598*** (4.14)	0.6335164** (2.38)	1.534902 (1.03)	123679.396 (0.39)
Access to credit	-28876.23 (-0.19)	-.4249028 (-0.62)	0.4753938 (0.23)	41397.21 (0.57)
Household size	23792.91 (0.35)	-.3150659 (-1.24)	0.0166301 (0.03)	-326876.7 (0.56)
Transportation cost	-2.636934 (-1.16)	-1.801492* (-1.65)	-1.837498 (-0.93)	-3785062* (-1.70)
Labour cost	-3.01439 (-0.03)	-1.801492* (-1.65)	-1.837498 (-0.93)	-3785062* (-1.70)
R square (R ²)	0.6367	0.9659	0.5943	0.8532
Adjusted R ²	0.5277	0.9403	0.2624	0.8091
F-ratio	5.84***	37.78***	1.79*	19.37***

Source: Field survey, 2014

***, **, * indicate variables are significant at 1.0%, 5%, and 10% risk level respectively.

Figures in parenthesis are the t-ratio

⁺ Lead equation

The result of the multiple regression estimates of the factors that influenced net income of artisanal fish retailers in Ndibe Beach, Afikpo North LGA of Ebonyi State, Nigeria, is shown in Table 6. The table result showed that all the functional forms (linear, exponential, semi-log and double log) of the regression were statistically significant at 1.0% probability level implying that any of the functional forms is adequate in estimating and explaining the variations in the profitability of artisanal fish retailers in the study area. However, the profit equation was best estimated and explained using the exponential functional form which explained 96.59% of the total variation at 1.0% risk level. Furthermore, other statistical and econometric considerations such as the number of significant coefficients and their conformity to a priori expectations were in favour of the exponential functional form. The F-statistic value of 37.78 is statistically significant at 1.0 alpha level, suggesting that the R^2 is significant and the estimated linear regression equation has goodness of fit.

Specifically the coefficient of age of the retailers (0.222483) was positive and statistically significant at 99.0% confidence level. The sign of the variable is in consonance with *a priori* expectation. This implies that the older the retailers, the more experience gained in marketing, hence, increased in net return. The experience gained as a result of old age and also while operating in the business would thus make significant impact. This is an index of entrepreneurial success (Ezeh *et al.*, 2012).

However, the positive coefficient of educational level (1.053168) was statistically significant at 1.0% risk level. This implies that the profit realized from the business increases as the literacy level of the marketers increases. This is in consonance with *a priori* expectation. The result agrees succinctly with (Onyebinama, 2004), who stated that the level of educational attainment is likely to affect the degree of one's business alertness and ability to seize business initiatives and advantages, hence increased profit.

The coefficient (0.6335164) of the price of artisanal fish was positive and statistically significant at 5.0% alpha level. This suggests that the profit arising from the sale of fish would increase as the price of the product increases. This result is in consonance with Kadurumba (2008) who obtained similar result in his study of economic efficiency of processed palm oil marketing in Imo state, Nigeria.

The coefficient of transportation cost (-1.801492) was negative and statistically significant

Osondu

at 10.0% alpha level. The sign is in accordance with *a priori* expectation. This implies that the higher the transportation cost (variable costs) incurred in artisanal fish marketing, the lower the profit of the retailers. This result supports the findings of Nwaru and Ekumankama (2002) that as variable cost increases, reduced inputs are used and hence low income.

Table 6: Estimate of factors that affect the net income of artisanal fish retailers in Ndibe Beach, Afikpo North LGA Ebonyi State of Nigeria.

Independent variable	Functional forms			
	Linear	Exponential	Double log	Semi log
Constant	305583.4 (0.51)	-1.67e+07 (-0.75)	14.9094 (0.76)	-287983.2 (-0.95)
Gender	-185657.3 (-1.08)	.2606564 (1.05)	-0.4081065 (1.09)	-481216.2 (1.14)
Age	14474.19 (0.09)	.222483*** (2.90)	1.928989* (1.93)	1044816 (0.93)
Marital status	-273027 (-1.02)	0.3201883 (0.51)	-0.7486112 (-0.80)	-85056.08 (-0.08)
Marketing experience	-19062.69 (-0.32)	1.58e-06 (1.34)	-0.4247507 (-1.12)	-307382.3 (-0.72)
Educational level	21796.9 (0.31)	1.053168* (1.82)	0.4634029 (1.36)	1071359*** (2.79)
Price of fish	1.077598*** (4.14)	0.6335164** (2.38)	1.534902 (1.03)	123679.396 (0.39)
Access to credit	-28876.23 (-0.19)	-0.4249028 (-0.62)	0.4753938 (0.23)	41397.21 (0.57)
Household size	23792.91 (0.35)	-0.3150659 (-1.24)	0.0166301 (0.03)	-326876.7 (0.56)
Transportation cost	-2.636934 (-1.16)	-1.801492* (-1.65)	-1.837498 (-0.93)	-3785062* (-1.70)
Labour cost	-3.01439 (-0.03)	0.0002762 (0.54)	.7636542 (0.74)	3654985*** (3.12)
R square (R ²)	0.6367	0.9659	0.5943	0.8532
Adjusted R ²	0.5277	0.9403	0.2624	0.8091
F-ratio	5.84***	37.78***	1.79*	19.37***

Source: Field survey, 2014.

***, **, * indicate variables are significant at 1.0%, 5%, and 10% risk level respectively.

Figures in parenthesis are the t-ratio

The challenges encountered by the fishermen in fish farming in Ndibe Beach, Afikpo North LGA Ebonyi State of Nigeria are presented in Table 7. The table showed that the major problems encountered by the fishermen in the study are were inadequate storage facilities (80.0%), access to credit (75.00%) and unpredictable weather (70.00%). Other constraints highlighted by the respondent are: high cost of fishing material (42.507%), Hostility of community members (42.50%) and lack of organized market (32.50%).

Table 7: The Constraints of artisanal fishermen in fishing activities in Ndibe Beach, Afikpo North LGA Ebonyi State of Nigeria

Constraints	Frequency*	Percentage
Inadequate storage facilities	32	80.0
Unpredictable weather	28	70.0
High cost of fishing material	17	42.50
Lack of organized market	13	32.50
Access to credit	30	75.00
Hostility of community members	17	42.50

Source: Field survey, 2014

* Multiple responses recorded

The constraints encountered by the artisanal fish marketers in the study area are presented in table 6. The problems encountered by the marketers in the study area were inadequate storage facilities (77.50%) and transportation difficulties (60.0%). Other constraints highlighted by the respondents that affect artisanal fish marketers were unsteady power supply (52.50%), inadequate capital (40.00%) and high marketing operating cost (35.00%). The high marketing operating costs was in terms of transport costs and drudgery associated with artisanal fish marketing.

Table 6: constraints encountered by fish marketers

Marketing constraints	Frequency*	Percentage
Inadequate storage facilities	31	77.50
High marketing operating cost	14	35.00
Transportation difficulties	24	60.00
Inadequate capital	16	40.00
Unsteady power supply	21	52.50

Source: Field survey, 2014

**Multiple responses recorded*

Conclusion and Implications for Policy

The estimates of the net return analysis showed that artisanal fishing was a profitable business venture. This was evidenced by the gross margin and net profit of N653, 803.0 and N449, 431.83 per annum respectively. From the study it can be adduced that though artisanal fishing was profitable, wholesalers got the bulk of the market margin and share. There was no particular sequence of marketing fish in the area as consumers had access to all market participants.

Furthermore, it was revealed from the study that age, household size, farming experience and access to credit were significant determinants of fishermen net returns while age, educational level, price of the product (fish) and transport cost were significant determinants of the marketers'(wholesalers and retailers) income.

The State Government should provide incentives that will motivate unemployed able bodied youths to embrace the business instead of staying idle. Government should assist in building ultramodern cold rooms and storage facilities to enhance fish storage in the area. There is the need for Government to cultivate the culture of maintaining basic infrastructure (roads and electric supply) as this will help solve transportation and storage problems. It is further recommended that Government and non –Governmental organizations should help provide service centers where fishermen could lease canoes and buy spare parts at a reduced rate. Fishermen and fish marketers should form Cooperative Societies/Groups to collectively handle problems associated with marketing and inadequate access to credit facilities.

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